Hydropower 101

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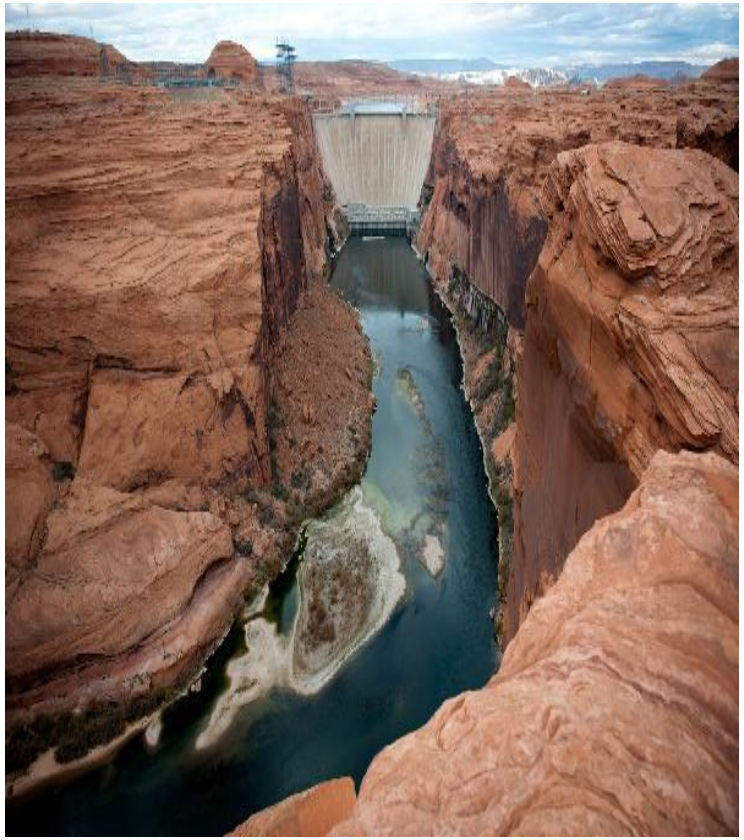
Western Area Power Administration

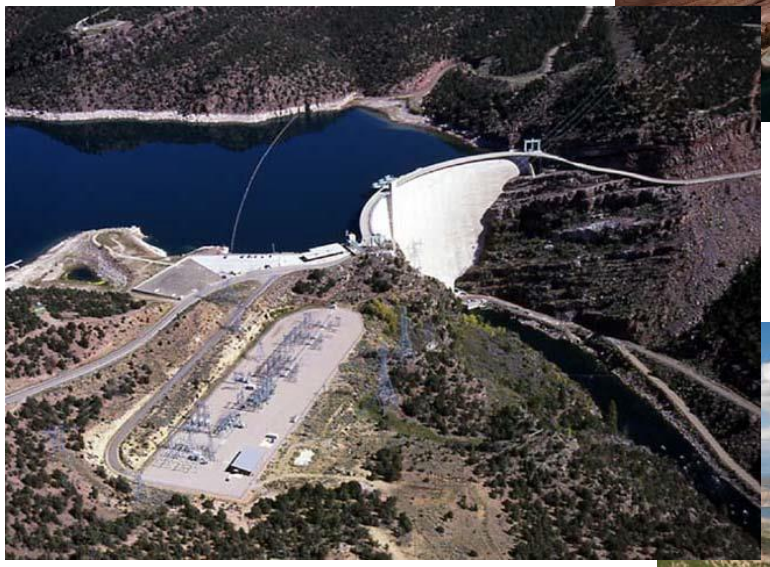
What is WAPA?



- A DOE power marketing administration
- Created in 1977 to separate the generation and transmission functions
- WAPA assumed Reclamation's function of marketing and delivering power generated at Federal hydroelectric powerplants in the west and mid-western U.S.

Colorado River Storage Project

- 12 power plants
- 27 generating units
- 1,827 MW total installed capacity (73% from Glen Canyon)
- 4,225 GWh Net Generation (74% from Glen Canyon)
- 2,325 circuit miles (Arizona, Colorado, New Mexico, Utah, Wyoming)



CRSP Management Center

- Committed to protecting the delicate balance of the Colorado River and its tributaries. Agencies that manage this river's resources must weigh multiuse needs: irrigation, recreation, hydropower, flood control, cultural resources, and native and non-native species, and endangered species protection.
- Balancing these resources with the needs of water and electrical energy is a chief concern.

Responsibilities

WAPA

- Owns and operates the transmission system infrastructure
- Markets, schedules and delivers energy to long term firm electric service customers
- Dispatches generation from the powerplants at the dams for electrical regulation and emergencies
- Rate setting and repayment of project debt to U.S. Treasury from revenue

Reclamation

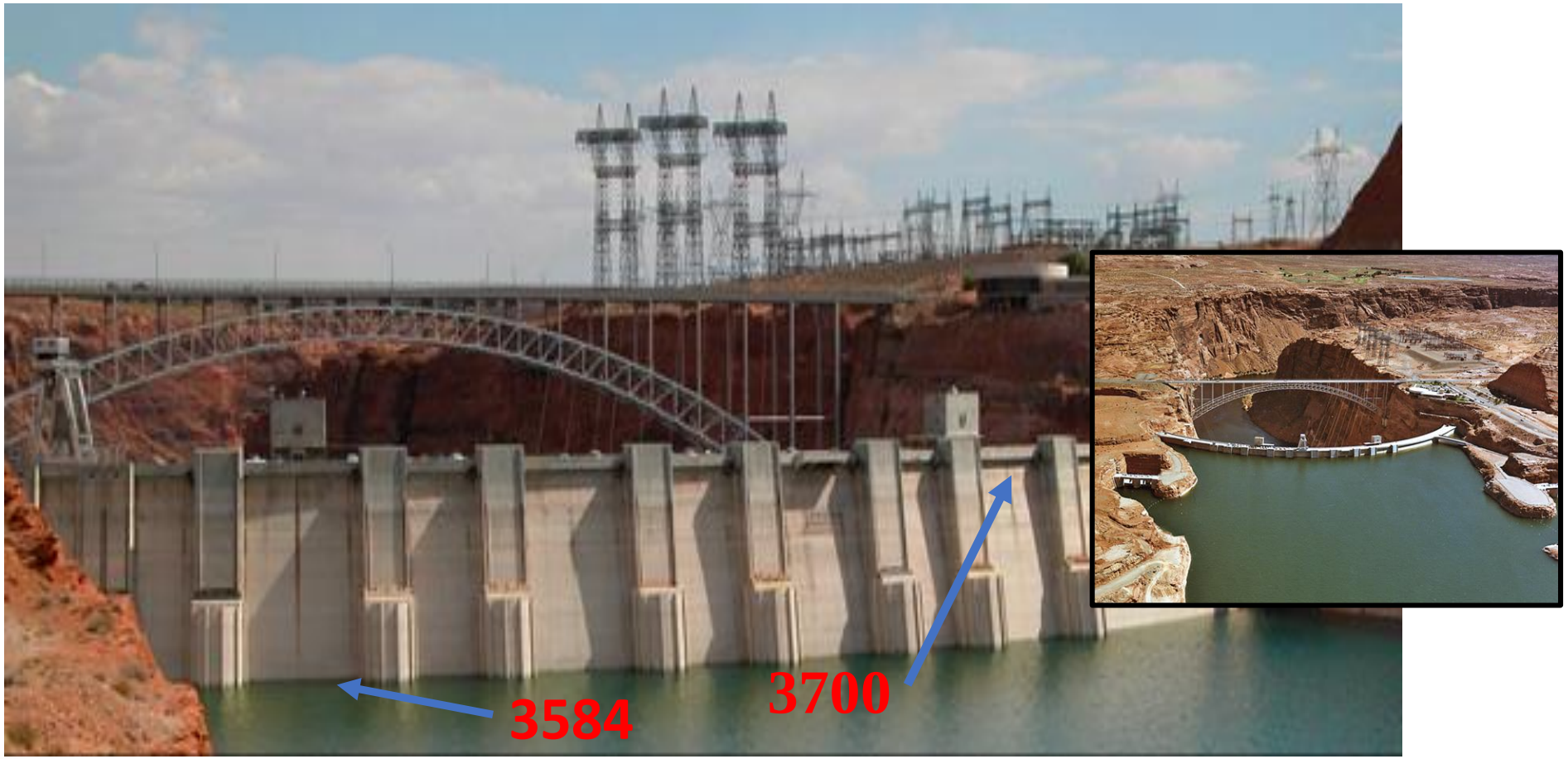
- Owns, operates, and maintains dams and power plants
- Water management (reservoir management, irrigation, flood control, and water compact deliveries)
- Generates power which is delivered to WAPA at the plant transformers

Electrical System Regulation and Emergencies

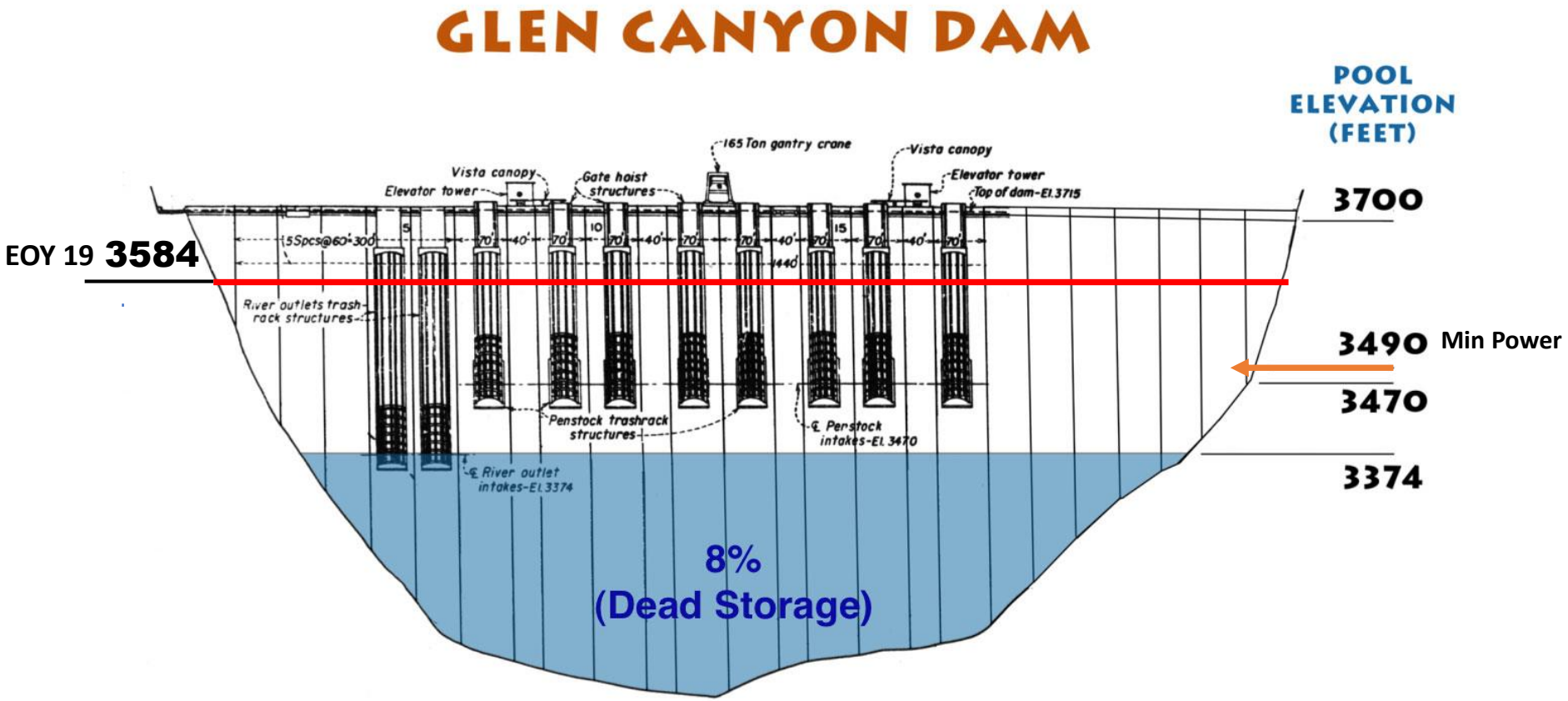
- NERC and WECC requirement of electrical utility
  - Contingency Reserves
  - Regulating Reserves
  - Black start/safe shutdown power
- Regulation signal
  - Comes from WAPA dispatch office to Glen Canyon Dam, every few seconds.
  - Purpose is to maintain system frequency while managing transmission line loading and providing voltage support
  - Changes caused by changes in demand or intermittent resource output

Lake Powell Elevation Affects Power Efficiency:

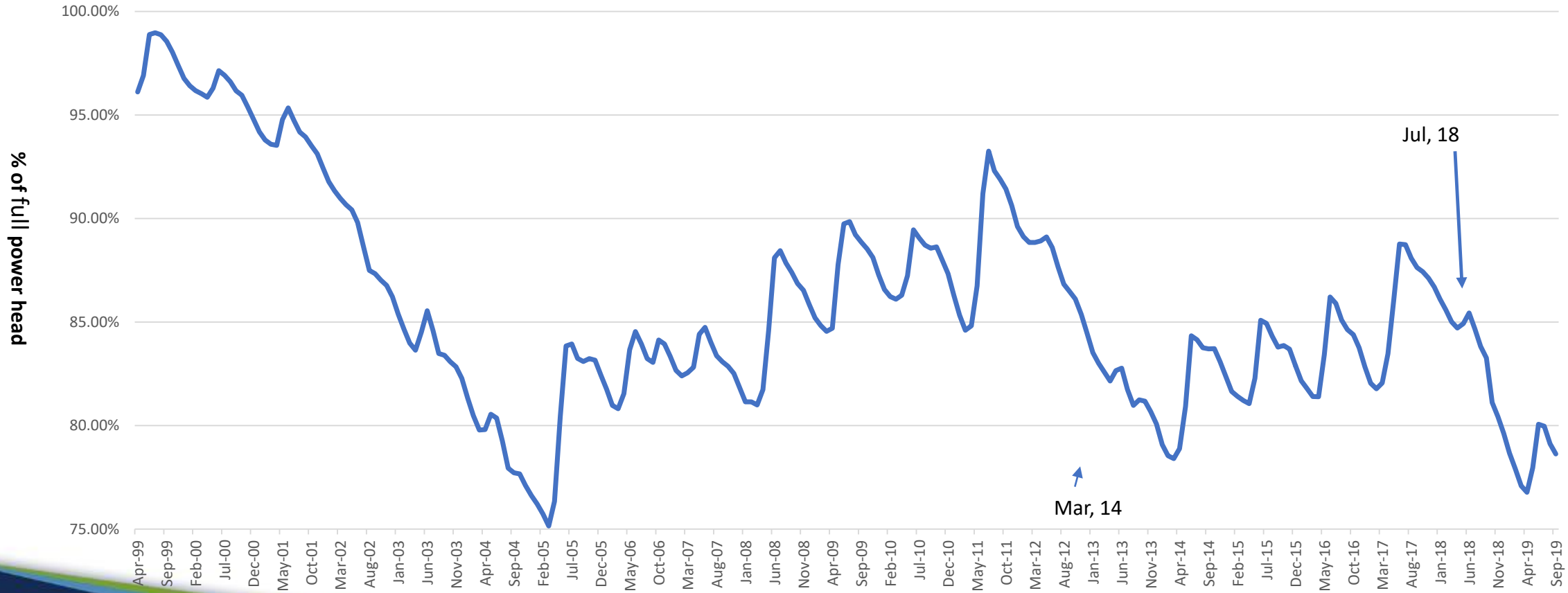
The efficiency in turning Acre Feet into Megawatt hours



Important Lake Powell Elevations



Glen Canyon Dam Hydropower Head From the beginning of current drought 1999 - 2019



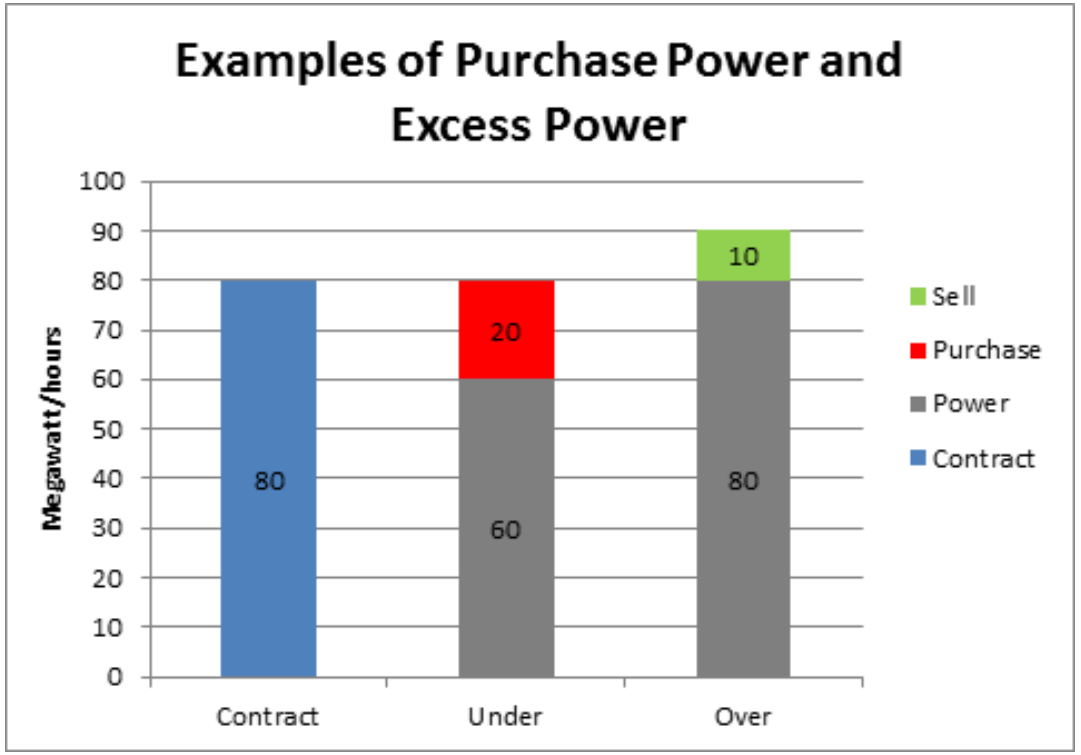
Western Area Power Administration

The Effect of Power Efficiency on Glen Canyon Dam Energy Production

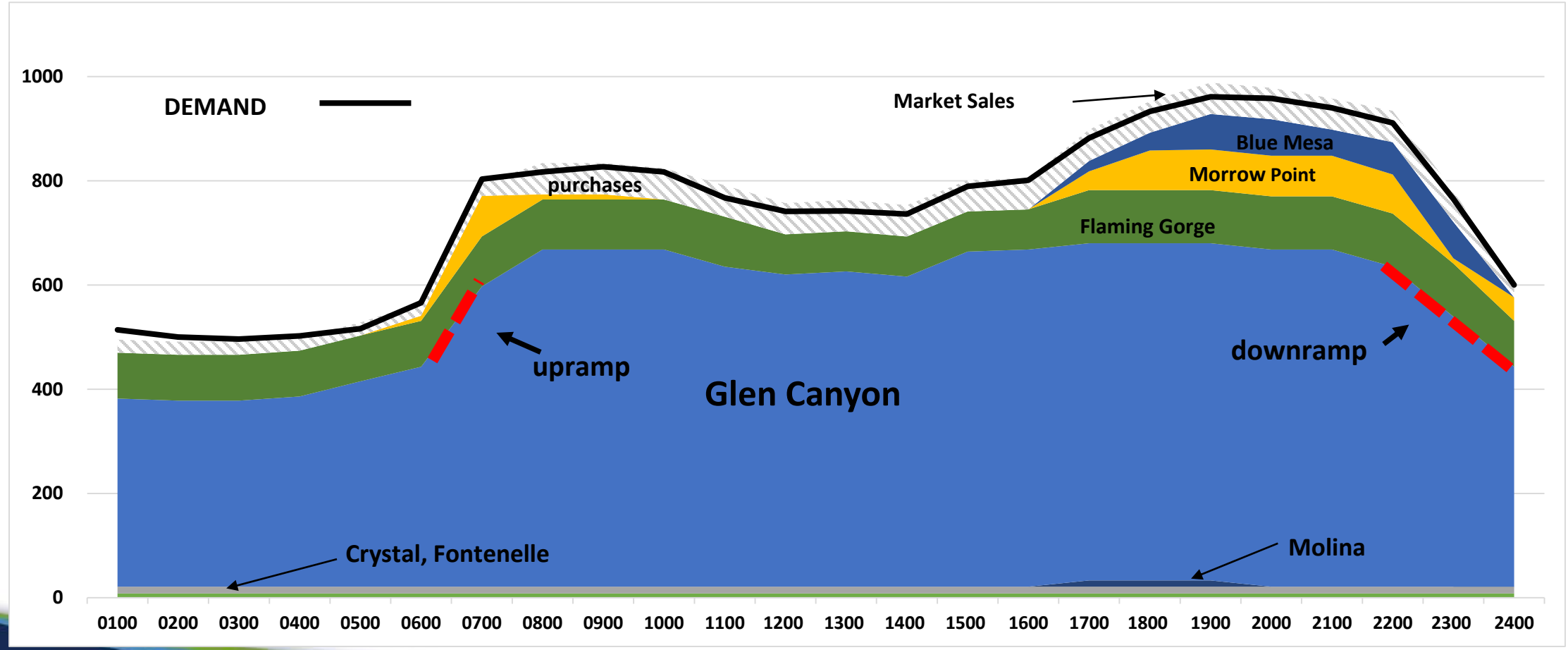
Date	Lake Powell Elevation (ft)	Energy production in a 9.0 maf year (GWh)	Percentage of production vs full powerhead
July, 1983	3,707.40	4,617	101.25%
Mar., 2005	3,555.90	3,378	74.09%
Jan., 2014	3,578.69	3,575	78.39%
Jan., 2018	3,619.38	3,916	85.89%
Jul., 2019	3,583.66	3,620	79.98%

Purchase Power

- Glen Canyon Releases
- Releases at other CRSP facilities
- Hydrology
- Pool Elevation/Efficiency
- Market Prices

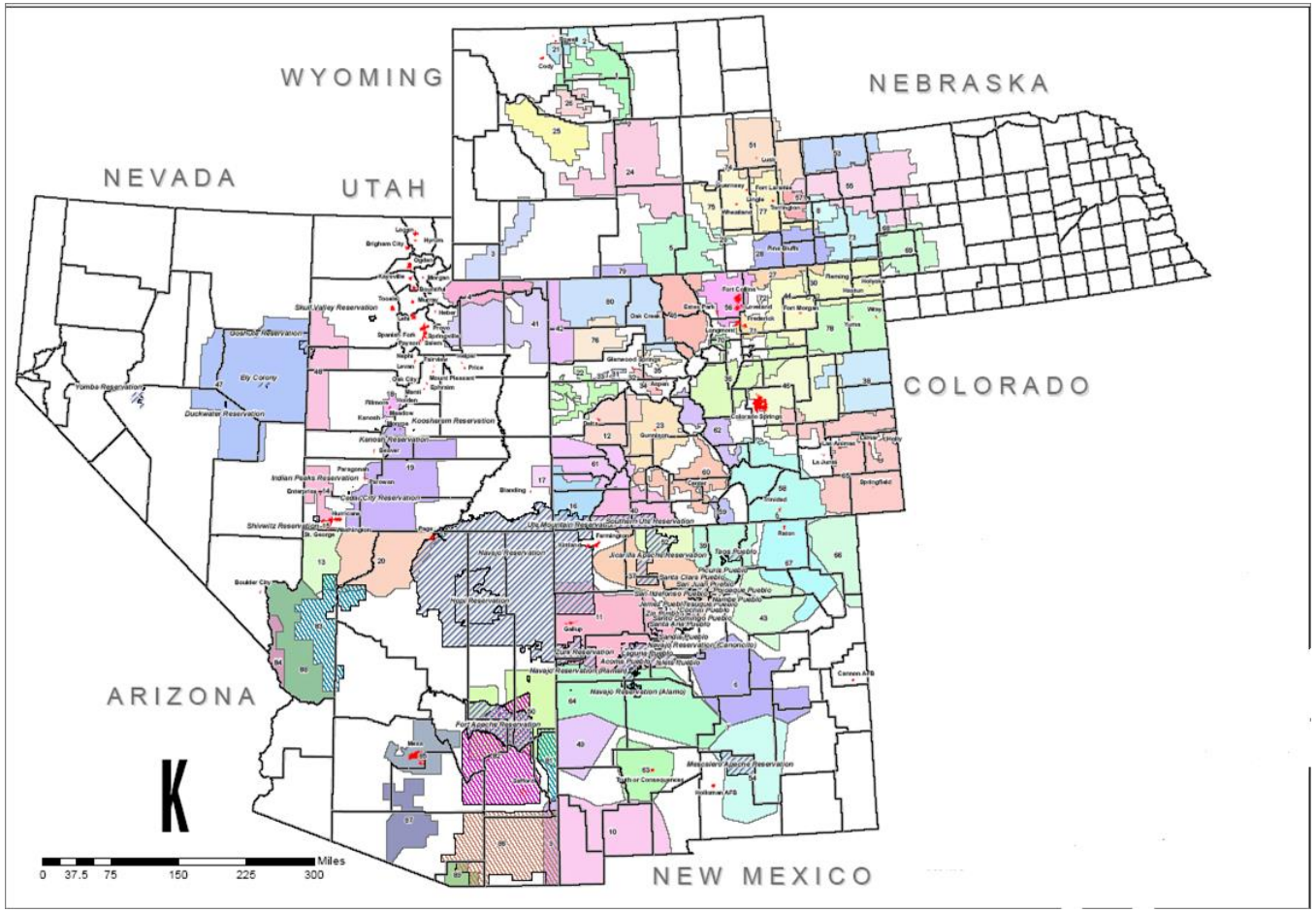


CRSP Generation vs Demand (data from Jan. 15 preschedule)



CRSP Customers

- 135 long-term customers
  - 54 Native American tribes
  - 64 Municipalities, cooperatives, irrigation districts
  - 17 Other



Setting CRSP Power Rates

Cost-based rates

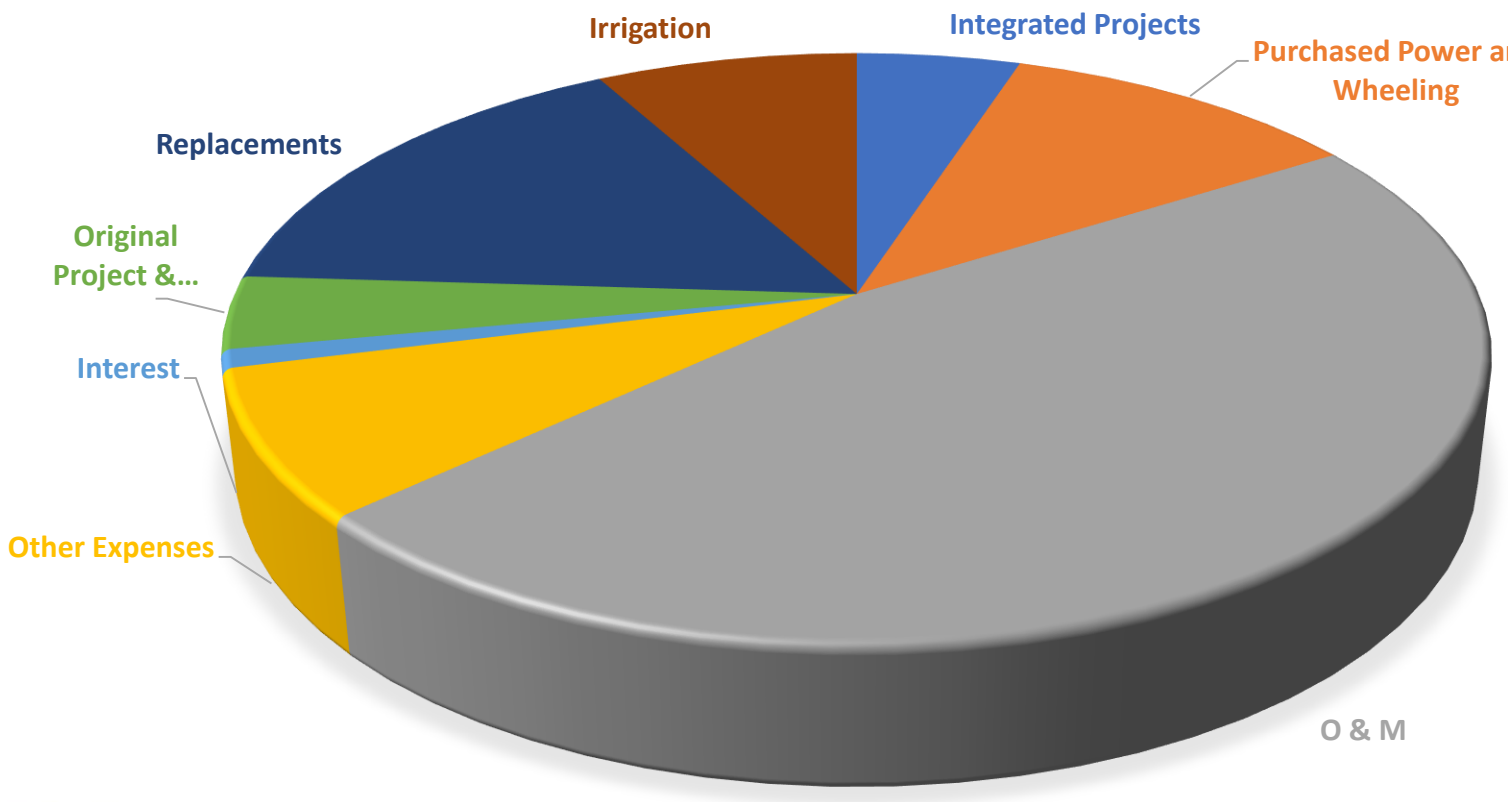
- Operations & maintenance
- Required principal & interest payments
- Amortized capital replacements (WAPA & BOR)
- Purchase power to “firm” contractual commitments
- Repayment of CRSP and participating irrigation projects
- Salinity Control Program – reduce salt in Colorado River water
- Repayment of Loan to fund Capitalized UCRIP expenses

Revenue requirement

- Rate = revenue requirement/projected energy sales
- Simplified Example:
  - $200 required revenue to cover costs
  - Contracts = 200 KWh of energy delivery
  - Rate = $1.00/KWh
- Rate change is done only if projected revenue is insufficient to meet future projected expenses

Basin Fund cash balance is not a component of the rate

What's in the SLCA/IP Rate

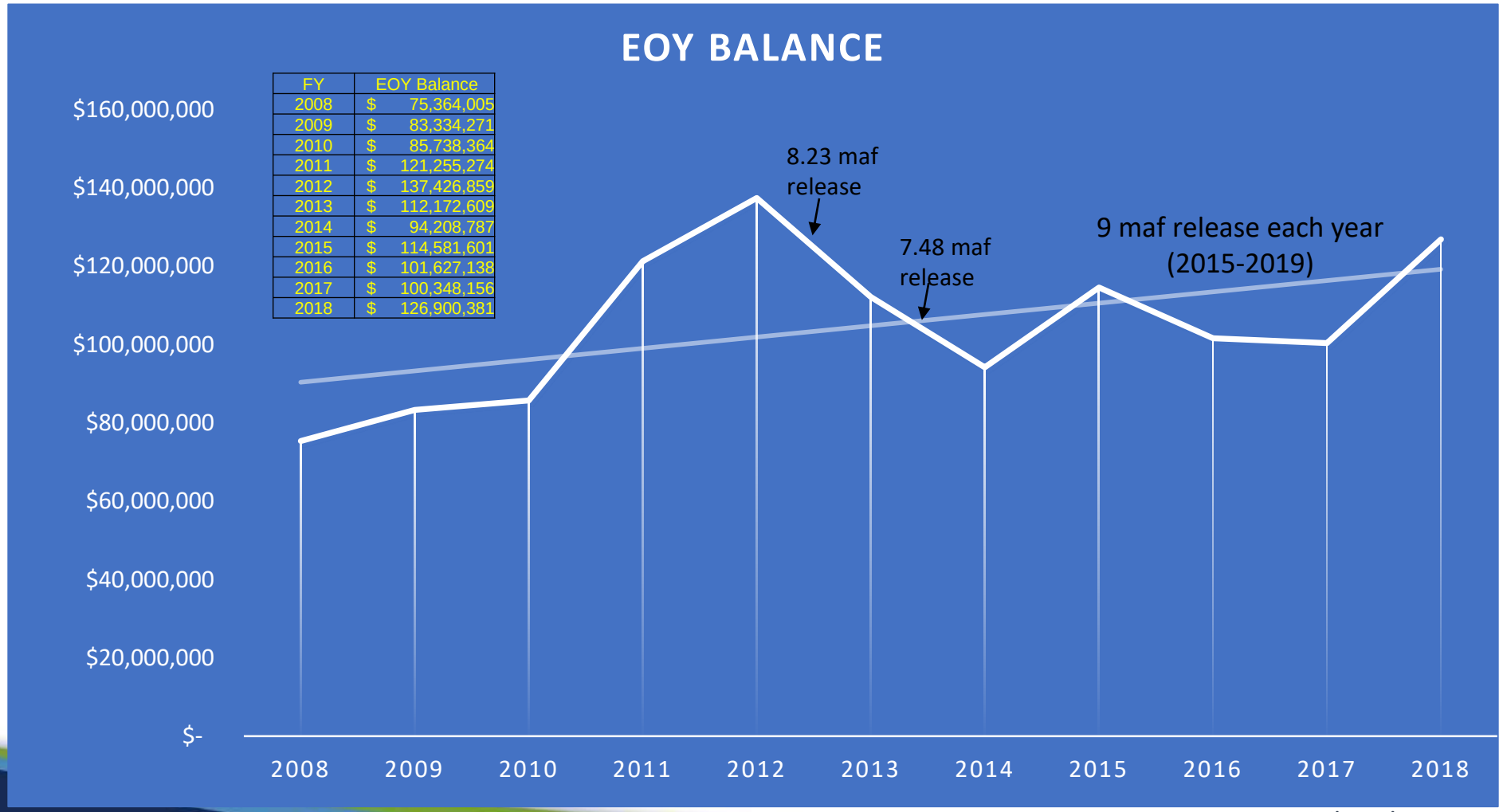


	FY2018
Total Revenue	$225
Operations & Maintenance	*$96.8*
Purchase Power & Wheeling	*$43.4*
States' MOA Funds	*$11.5*
Repayment of Investment	*$61.3*
Interest on Investment	*$12.7*
Total Costs	$225

Basin Fund Obligations

- Manage the financial requirements of the CRSP Act
  - Glen Canyon, Aspinall, Flaming Gorge
  - Several additional units that include dams, reservoirs, powerplants, transmission facilities and other related works
- Reclamation operations are funded by periodic transfers from the CRSP Basin Fund to a Reclamation subaccount
  - Allows Reclamation to maintain programmatic oversight of their facilities
  - Funds are transferred approximately on a monthly basis and only the amount they need to operate for the fiscal year

Basin Fund Balance
FY 2008 - 2018



CRSP Basin Fund Status

- Current FY 2019 Balance...$128M
  - As of 6/24/2019
- Projected FYE 2019 Balance…..$117M or $146M*

  * Projection based on actual revenue and expense data through June 24th. Difference is due to potential M&I monies being placed in the Basin fund by Reclamation.
- Direction to return cash?
  - Last cash return was $25M to the General Fund of the U.S. Treasury in 2012
  - No cash return was made in 2013-2018.
  - Annual Constructive Returns (non-cash) around $18-23M per year (2013-2018)
  - FY19 will be significantly lower due to OMB direction to not transfer funds to Reclamation

Basin Fund Balance

Reserve Strategy

- WAPA-wide strategy for maintaining fund balances
- CRSP target is ~$180M
- Projected end of fiscal year balance is $112M

Risk Factors

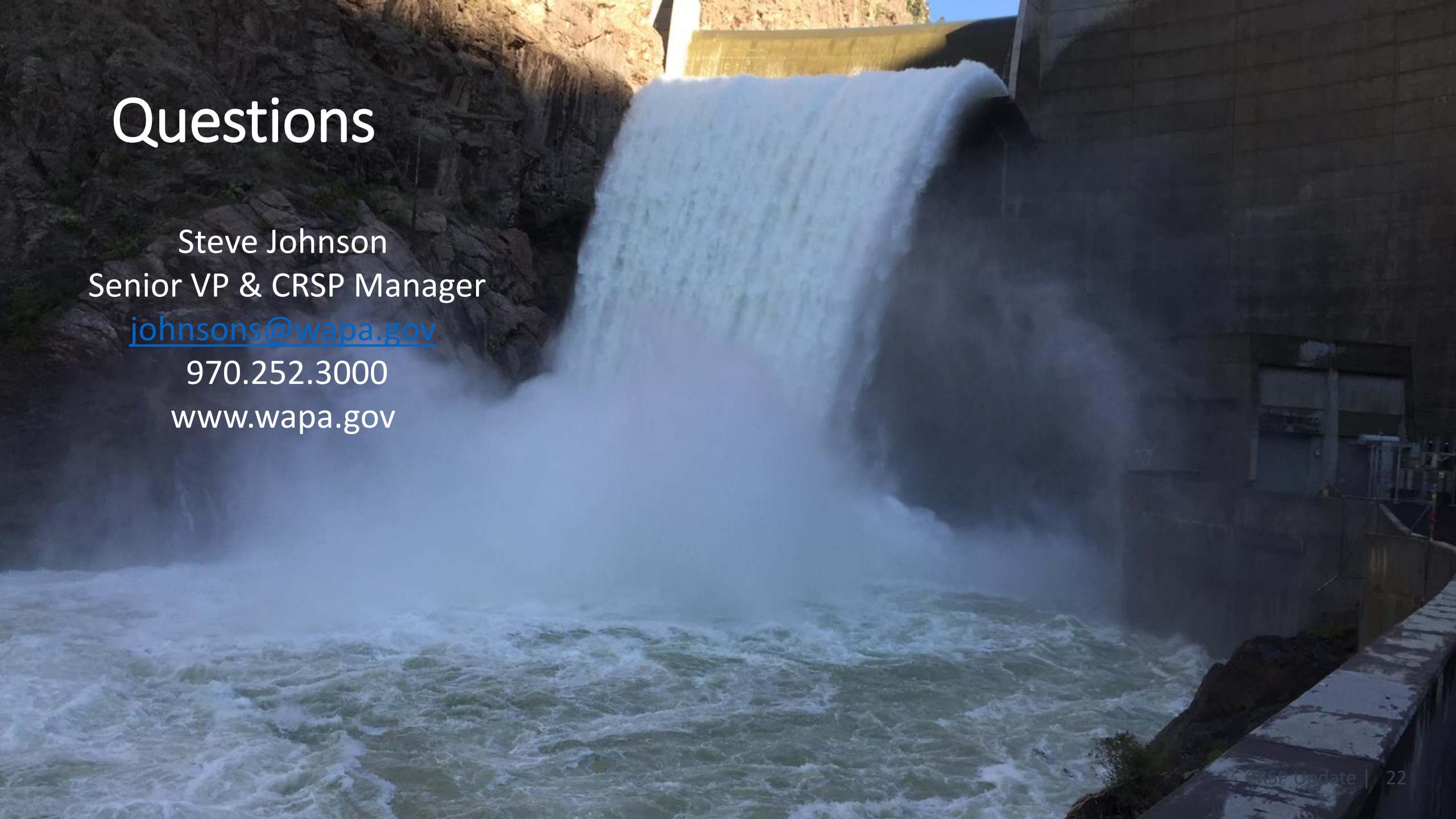
- Replacements (Reclamation & WAPA)
- Environmental Programs
- Bypass (including Spring Flows out of Flaming Gorge and Aspinall)
- Market Price for Purchase Power
- Hydrology/Releases/Pool Elevation

Environment and Cultural Resources

- Environmental programs (historically) funded by CRSP electric power revenues
  - Upper Colorado Recovery Program – endangered fish species program - $6 million, annually
  - San Juan Recovery Program – endangered fish species program - $2 million, annually
  - Glen Canyon Dam Adaptive Management Program – environmental program in the Grand Canyon - $10 million, annually
  - Salinity Control Program – reduce salt in Colorado River water - $2 million
- Note: In 2019, CRSP power revenues are not funding the RIPs and the GCDAMP

CRSP Challenges and Opportunities

- Drought
- State Apportionment/MOA
- Basin Fund and Returns to Treasury
- Operations within a changing energy mix



Questions

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